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ABSTRACT

Plants that have been identified as stabilizers and beautifiers of coastal dunes are described in this publication from the Soil Conservation Service (SCS). After years of tests and field trials, the SCS has singled out 43 plants as having good potential for dune revegetation based on their characteristics for erosion control, frequency of occurrence, and dominance in the natural ecosystem. The propagation techniques, habitat establishment, and the characteristic features of each of these 43 plants are explained. Information is also presented on the topics of: (1) coastal dune formation; (2) dune ecosystems; (3) revegetation planning; (4) dune plant selection and establishment; (5) planting herbaceous plants; and (6) planting trees and shrubs. An appendix contains a listing of the specified plants and the frequency of their occurrence on the Gulf and South Atlantic Coasts and in Puerto Rico. (ML)

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Agriculture Information Bulletin 460

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Plants for Coastal Dunes

of the Gulf and South Atlantic Coasts and Puerto Rico

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Severe erosion of this dune is evident from the sparse vegetation and steep, unstable slope.

Plants for Coastal Dunes of the Gulf and South Atlantic Coasts and Puerto Rico

by Robert M. Craig[1]

Dunes and beaches make up nearly 1,800 of the 3,000 miles of seacoast in the five Gulf states, Georgia, and Puerto Rico. Erosion is a problem on about 900 miles of Atlantic and Gulf coast dunes and beaches in these areas. With the right kinds of native and naturalized plants, much of this erosion can be prevented.

This publication was written to help people select and use plants to stabilize and beautify dunes. It is intended mainly for planners, landscapers, nursery operators, developers, and homeowners. The information applies to coastal dunes and beaches of Puerto Rico, Texas, Mississippi, Louisiana, Alabama, Florida, and Georgia.

In contrast, this dune is stabilized by dense cover of adapted native vegetation. The plant in foreground is sea lavender, a threatened species in Florida.

Using plants to control dune erosion is a high priority of Soil Conservation Service (SCS) plant materials programs in coastal states and the Caribbean Area. From 1973 to 1975, 191 representative dune sites were studied in Georgia, Florida, Alabama, and Puerto Rico (*4, 5, 6, 7, 8*).[2] These studies identified more than 200 species of native and naturalized dune plants and were supplemented by less detailed studies in Texas, Mississippi, and Louisiana.

Of the plant species identified in the SCS field studies, 43 have good potential for dune revegetation because of their favorable characteristics for erosion control, their frequency of occurrence, and their dominance in the natural ecosystem. This publication describes each of these 43 plants, their areas of occurrence, and propagation techniques.

Ocean waves, littoral drift, and other natural forces—as well as the activities of people—determine the adaptability and suitability of plants for coastal dunes. This publication explains how the dune ecosystem and the actions of people must be considered in planning revegetation. It also discusses methods of preparing the planting site and establishing and maintaining the plants.

SCS has selected some of the featured plants for thorough testing and comparison. Several years of tests and field trials are required before SCS and cooperating agencies can identify superior plants and release approved cultivars. These cultivars are the source of commercially produced seed and planting stock used in local conservation programs.

For further assistance in protecting coastal dunes, contact your local SCS office, which generally is listed in municipal telephone directories under "United States Government, Department of Agriculture."

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[2] Numbers in italic refer to "References," page 40.

Exposed roots show the severity of shoreline erosion along the Gulf coast near Panama City, Fla.

How Coastal Dunes Form

Coastal dunes range from seemingly insignificant sand hills to formations more than 50 feet high. Unvegetated dunes are vulnerable to destruction by the same forces that form them—waves and wind.

Coastal dunes are built by sand that blows into a vegetated area on the beach. They act as dikes against flooding and as reservoirs of sand to replenish the beach. During hurricanes, dune sand washes into the sea and reduces the energy of storm waves. To provide these benefits, however, the dune must be protected.

Excessive foot or vehicle traffic and construction activities can destroy the natural vegetation that holds a dune in place. Construction too close to the water can also destroy dunes. When dunes are flattened, when buildings are constructed on them, or when sea walls are built, the natural balance of dune, beach, and littoral drift processes is disrupted.

For success in revegetating dunes, it's important to understand the interaction of these processes. Along Florida's Atlantic coast, for example, waves are not very large or close together during early spring and summer. As a wave breaks, it stirs up sand, which remains briefly in suspension. As the water runs up the beach face and soaks in, it deposits most of its load of sand. Gradually, the beach becomes higher, steeper, and wider.

In winter, however, stormy weather brings large waves that are usually close together. Less water soaks into the beach, and as the water from each wave recedes, it erodes some beach sand. The beach becomes gradually narrower, and the eroded sand settles offshore to form a sand bar. As the sand bar builds, the water over it becomes shallower, waves break farther from the beach, and the beach face becomes less steep. Over an average year, this pattern of erosion and deposition creates a balance.

Abnormal tides and waves can upset this balance, and the long-term balance is not precisely equal from year to year. Nevertheless, the overall result is a stable offshore bar and stable beach.

Littoral drift is the movement of sand along the coast by waves. Waves coming straight at the beach cause only slight littoral drift. However, if the waves approach the beach at an angle, the sand they stir up moves along the water's edge.

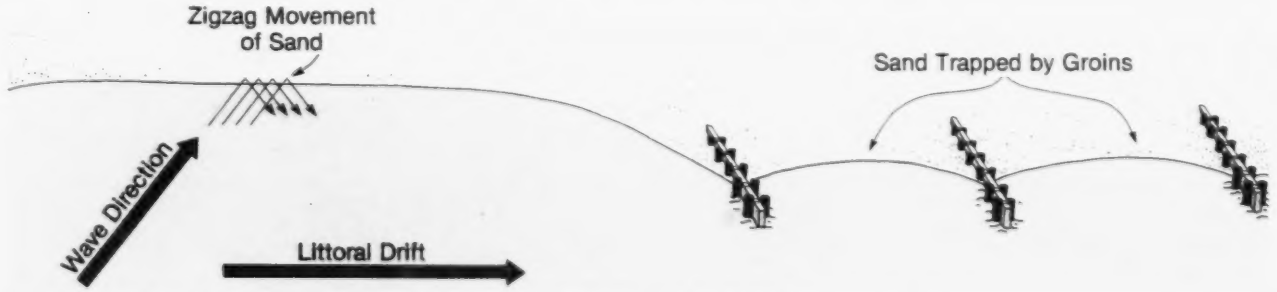
Littoral drift, therefore, affects a sand bar's location, size, and rates of formation and erosion. If a barrier such as a jetty or groin is put across the littoral zone, sand will collect on the updrift side. The beach on the downdrift side may erode, however, unless measures are taken to protect it.

Along the Atlantic coast of Florida and Georgia, littoral drift generally is south to north during summer and north to south during fall and winter. The predominant annual trend is north to south.

Along the lower Gulf coast of Florida, wave action is light to moderate except during hurricanes. The predominant direction of littoral drift differs from place to place and in some areas cannot be identified.

Along the Gulf coast of extreme west Florida and of Alabama, Louisiana, and Mississippi, littoral drift is generally westward. In Texas it is northeast to southwest along the upper coast and south to north along the lower coast.

In Puerto Rico, the only significant sand dunes are on the northern coast. Littoral drift there varies and has no predominant trend.



Littoral drift must be considered in any plan for building sand dunes or protecting the shoreline. In the drawing, waves move sand in a zigzag pattern until the sand is intercepted by groins.

Many kinds of plants thrive in the dune ecosystem. They are astonishingly tolerant to salinity, high temperatures, very low fertility, wind abrasion, and extremes of wet and dry soil conditions.

Salt Spray and Wind

Salt spray is the most important environmental factor limiting the adaptability of plants to coastal dunes. When waves break, the wind blows droplets of water inland. As the spray blows inland, the water evaporates and salt crystals drift to the ground. Salt can inhibit the growth of trees such as sand live oak, but the effect of salt spray is modified by the orientation of the coast to prevailing winds.

Plants nearest the ocean shield those behind them by stopping some of the salt crystals and spray. In undisturbed areas a delicate balance is achieved. Sudden removal of the seaward vegetation usually injures newly exposed plants.

Salt spray is a major source of plant nutrients in dune soils. It provides potassium, sodium, calcium, and magnesium (*22*). The annual addition of these nutrients is only slightly higher than the amount removed by leaching and plant uptake. In areas artificially sheltered from the salt-bearing onshore winds, most coastal dune plants grow poorly or die.

Wind and salt spray have dramatic effects on the growth and appearance of sand live oak growing adjacent to the ocean.

The wind, besides transporting salt spray, has other profound effects on plants. Windswept tree and shrub forms are common on coastal dunes. Strong winds from storms can extensively damage plants—sandblasting, uprooting, or burying them. Hurricane winds can shred leaves, expose roots by erosion, and destroy delicate plant tissue. Tides and waves associated with hurricanes can also damage plants extensively. Along the Atlantic coast in winter, damage from northeast storms can be especially severe. South-facing beaches are less affected by these storms.

Hardy grasses struggle for a toehold in the hot, shifting surface of coastal dune sand.

Temperature

Native coastal dune plants are remarkably adapted to high temperature, and one marvels at the survivability of young seedlings. Temperature readings on North Carolina beaches showed that bare sand surfaces were as much as 49°F higher than air temperature (*13*). The same study showed that the temperature under 1 inch of dead grass mulch was 31°F lower than the bare sand. By keeping the soil cooler, mulch improves seed germination and seedling survival.

Soil

Beaches and dunes along the Atlantic coast of Georgia and Florida are generally composed of quartz sand with widely varying shell content. At some locations in Florida, the soil is composed of broken shell and coquina (soft limestone), with little or no sand. Along the Gulf of Mexico, coastal dune soils are composed of fine white sand and bleached shell fragments.

In Puerto Rico, coastal dunes and beaches are composed of sand made up primarily of shell fragments and quartz and other siliceous materials. There are also a few areas of exposed limestone bedrock and consolidated sand called beach rock.

Coastal dune sand typically is low in nutrients, especially nitrogen. Test the soil before attempting an extensive fertilization program, because nutrient content of dune soil varies widely from place to place.

The depth of rainwater penetration in a dune is irregular, because the top sheds some water. Water penetration is also inhibited by surface crusting in soils with a high percentage of very fine particles.

Water moves swiftly downward through a dune, however. During summer, the surface begins to dry minutes after the rain stops. Rapid percolation and drying can contribute to moisture stress, especially in shallow-planted seed and in seedlings.

Fortunately, dune sand offers little resistance to roots. Established dune plants often develop extensive root systems that can take up water from deep in the soil.

Planning Revegetation on Coastal Dunes

Plantings should be designed as part of a comprehensive plan for protecting the coastal dune area. Consider the surrounding area, not just the dune site. First, determine why the dune is eroding or why sand cannot accumulate to form a dune. For example, a dense stand of Australian pine may have eliminated sand-trapping plants. Or a structure such as a jetty across a littoral zone may be causing the beach to erode on its downdrift side.

Removing the cause may be all that is needed to allow natural revegetation. In the above examples it may be possible to rebuild a dune simply by replacing the Australian pine with sand-trapping plants or by removing the structures.

It is often necessary, however, to modify the surface to stabilize the site for planting or for natural plant succession. The dune or beach may require mechanical reshaping, sand-trapping devices, or surface stabilizers.

Structural measures can aid revegetation if they are properly designed and installed. Major structural measures include seawalls, revetments, bulkheads, groins, breakwaters, and jetties. Other widely used remedial measures include beach fill and periodic beach nourishment. Periodic nourishment consists of mechanically or hydraulically replenishing the beach with sand to offset continuing erosion. Beach fill consists of mechanically or hydraulically rebuilding a beach seaward and maintaining the new alignment through periodic nourishment.

Access walkways can prevent the concentrated foot traffic that will destroy dune vegetation. Most access structures are made of wood and act as a bridge around or over the dune. They should be conveniently placed, but the dune itself should be modified or disturbed as little as possible.

Construction setback lines established by state or local government are an important and effective tool for protecting coastal dunes. In 1971, for example, the Florida legislature passed a law establishing reasonable restrictions on coastal construction and excavation (*18*). The intent was to prevent construction from encroaching on coastal dunes if it would cause or increase erosion at the site or on neighboring beaches and shore properties.

An example of well-planned dune protection: a dense cover of adapted grasses and a walkway that allows access to the beach without endangering the dunes.

For more information on the use of structures for beach and shore protection, see a brochure published by the U.S. Army Corps of Engineers, *Low Cost Shore Protection*. The Corps has also published three indepth supplements to this brochure: one written for

The near-burial of this sand fence is proof of its effectiveness in building dunes.

property owners, one for local government officials, and one for engineers and contractors. Address requests to U.S. Army Corps of Engineers, Publications Depot, 890 S. Pickett St., Alexandria VA 22304.

Sand-Trapping Devices

Sand-trapping devices are porous barriers. They reduce wind velocity enough that sand drops out of the wind stream and accumulates on both sides of the barrier. A dune forms as sand accumulates to the top of the barrier.

Effective **sand-trapping fences** can be made of wooden slats or jute or plastic mesh. Experiments in Texas indicate that fences with a porosity of 40 to 60 percent produce the best results (*11*). If possible, place the fences at least 2 feet above mean high tide to minimize damage from high lunar tides, during the equinox, and from large waves generated by severe storm winds. If possible, fences should be constructed across the prevailing wind path.

Fenceposts should be spaced about 10 feet apart and driven well into the soil. In general, fences placed parallel to the shoreline are adequate. If, however, they are placed at a right angle to the shoreline, they trap sand that blows along the beach. Using a single line of fencing has proved successful and economical. Jagschitz and Wakefield, however, recommend two designs for parallel fencing (*15*). One consists of two parallel fences 20 feet apart and connected with a crossover fence at 50-foot intervals. The other is a main line of fencing intersected at 50-foot intervals by 30-foot-long secondary fences placed at a right angle to the main line.

Brush matting is another kind of sand-trapping device (*4*). Place a single complete layer of branches or young trees flat on the ground along the windward edge of a planted site, with the butt ends of the branches facing windward. A second row can be laid partly over the first layer on its windward side, shingle fashion. On steep dunes, secure the brush with wire and stakes.

This new planting of seaoats and seashore paspalum is protected by an erosion-control fabric made of plastic netting interwoven with strips of paper.

Surface Mulch

The soil at the planting site must be kept well protected until the plants are established. If instability is a problem, a surface mulch may be necessary. The type and amount of surface mulch to use must be determined for each site. Mulching in conjunction with seeding is generally applicable only in intensively managed areas.

Common surface mulch materials are emulsified or liquid asphalt, plastic soil stabilizer, wood cellulose fiber, bonded fiber blanket, mesh netting, hay, straw, and brush. Special equipment is required to apply most of the asphalt and plastic products. Straw or hay mulch can be held in place by lightly disking it, by mesh netting, or by asphalt and plastic products. The application rate of straw or hay mulch is generally 2,000 to 3,000 pounds per acre, or 50 to 75 pounds per 1,000 square feet.

Select plants that are naturally adapted to the local coastal dune areas. Examine nearby sites for the species featured in this publication.

The plant descriptions (pages 10 to 39) indicate only the areas where the plants occur on coastal dunes; many of them also grow inland. The phrase "south Atlantic" used in the plant descriptions refers only to coastal Georgia and Florida (including the Florida Keys), although some of the plants grow north of these states.

Dune Vegetation Zones

Most coastal dunes have three general zones of vegetation, based mainly on soil salinity. Closest to the ocean is the **frontal dune zone,** which supports mainly grasses and other herbaceous plants and has the most exposure to salt spray. A trough and additional inland dunes may occur within the frontal zone.

Leeward of the frontal dune is the **backdune zone.** It supports trees, shrubs, and vines as well as grasses and other herbaceous plants. Farthest from the ocean is the **forest zone,** which supports pines and hardwoods. Many areas have marshy grasslands seaward of the forest zone.

The appendix on page 41 indicates the dune zone where each of the 43 featured plants is most likely to occur. It also indicates their frequency on the sites included in the SCS field studies. The appendix may be useful in determining the likelihood of finding a specific plant growing in your area.

General Planting Information

In most years, planting can be done in winter or early spring. Planting in late February or March is suggested, because the plants can be well rooted and established before hot weather. Except for the woody species, good results can also be achieved by planting during the summer, when soil moisture is optimum for the region. Take special care, however, to keep the soil moist for germination and seedling development. Avoid planting during the dry season. Instead, plant when the risks of loss by sandblasting, moisture stress, and erosion are lowest.

Maintain planted areas by reestablishing plants that do not survive and by correcting local problems with measures such as surface mulch, sand-trapping devices, and access walkways.

Page 10 describes general planting methods for most of the herbaceous plants; page 23 describes methods for most of the trees and shrubs. Supplementary details, as

This cross section is representative of many coastal dunes. There is much variation, however, in the shape and elevation of dunes and in the widths of the vegetation zones.

Frontal dune zone along the Atlantic coast. The low area nearest the ocean has a cover mainly of grasses. Other herbaceous plants and woody species are densely clustered in the upper part of the dune.

Backdune zone with a variety of species. The yellow flowers are partridge pea. Top of foredune shows in the distance.

appropriate, are provided in the descriptions of individual plants. Where the descriptions give more than one planting method, each is equally successful unless the text says otherwise.

Plant Names

In the plant descriptions, the common names used are those that are generally accepted in the areas where the plants are most common. For plants that occur on dunes of Puerto Rico, common names are given in Spanish as well as English. The authority for nearly all the scientific names is the SCS *National List of Scientific Plant Names* (*20*).

Planting Herbaceous Plants

Thirteen grasses and nine other herbaceous plants have special value for erosion control and landscaping in dune areas. Ten of the grasses spread by rhizomes, stolons, or both; three are bunchgrasses. Of the other herbaceous plants, three are vines or have a viny growth form; five have a creeping, decumbent, or prostrate form; and one is a large upright plant.

For most of the 22 featured herbaceous plants, seed are difficult to harvest without special equipment. Seed or other planting material is generally difficult to obtain, but St. Augustine grass, common bermudagrass, and seaoats are produced commercially.

Vegetative material is generally used for planting. Small amounts of planting material can be obtained by thinning natural areas of dense growth. Two cautions are in order, however. First, find out if the plant is on a state list of threatened or endangered species or has other legal protection that restricts its harvest or removal. Second, if harvesting seed or taking plant material is permissible, be sure that you don't take so much that the source area will be damaged as a result. A supply for planting on your site can be raised in a nursery, field grown by experienced persons, or purchased from a commercial grower of coastal plants.

In general, plant vigorous mature plants 1 to 2 feet apart in rows 2 feet apart. You can space the plants more closely to speed the accumulation of sand. Plant the area uniformly, however; unequal plant density promotes erosion.

Large areas can be planted with a conventional two-row transplanter of the type commonly used with crops such as tobacco (*24*). The only modification required is to extend the openers or shoes to provide a furrow about 8 inches deep. On fairly smooth areas, a wheel-type farm tractor is adequate as a power source.

Small areas can be planted by hand with a nursery spade, a sharpshooter spade 4½ inches wide, or a woodsplitting wedge welded to a length of pipe.

Plant tall beach grasses and other tall herbaceous plants upright in the soil about 8 inches deep (see descriptions of individual plants for more details and for exceptions to general methods described here). Part of the leaf surface may be buried. Do not trim the leaves before planting. Set the plant in the soil and pack the soil firmly around it with your heel. Keep the roots moist during the planting operation.

Herbaceous plants will become established faster if they are fertilized. Test the soil or consult local agricultural specialists to determine the amounts and kinds of fertilizer needed. Nearly all dune soils are deficient in nitrogen. Most coastal dune soils along the Atlantic coast of Florida and Georgia and the southern Gulf coast of Florida have adequate potassium and phosphorus. In the other Gulf states and in Puerto Rico, potassium and phosphorus are inadequate in most dune soils.

In general, apply fertilizer at planting time, weekly for 2 or 3 weeks thereafter, and again 6 weeks after planting (*10*). Frequent applications are more effective than a single large application, because nutrients leach readily from dune soil. A fall application of fertilizer is especially important for rhizome production by grasses the following spring.

Apply recommended amounts annually until full cover is developed. This usually occurs by the end of the third growing season. Attempts to push growth beyond this point may have some detrimental effects. For example, growth of common fungus *(Rhizoctonia solani)* may be increased by heavy matted growth, which limits air circulation and normal dryness (*24*). Fertilization can be reduced or skipped in alternate years once full cover is reached. Where water is available and inexpensive, a sprinkler system can be used to increase growth rates.

Grasses

Bitter panicum (*Panicum amarum* Elliott)

Bitter panicum is a perennial grass on dunes throughout the south Atlantic and Gulf of Mexico region. It is most common in southern Florida and in Texas.

The plants grow to an average height of 3 to 4 feet. Leaves are smooth and bluish green. Seed heads are narrow, compressed, and generally sparsely seeded. Plants spread from a very aggressive, scattered system of rhizomes, but the stands are rather open.

Bitter panicum produces few viable seed, but it is better adapted for transplanting than seaoats (*9*). It can be propagated from a stem with part of the rhizome attached or from an 8- to 12-inch length of rhizome without the above-ground part. Plant the rhizome 4 inches deep in early spring (*13*). Spacing should be no more than 6 feet.

Another method of propagation is to snap off robust stems at ground level and plant them at an angle of about 45°, so that several nodes are buried.

Bitter panicum

Coastal panicgrass

Coastal panicgrass (*Panicum amarum* v. *amarulum* [A. Hitchc. & Chase] P. G. Palmer)

Coastal panicgrass is a somewhat dense, upright perennial bunchgrass on coastal dunes throughout the south Atlantic and Gulf region. It is a dominant plant at many locations especially in west Florida, Alabama, and Texas. The scientific name used here is based on a herbarium specimen identified by Dr. Edward E. Terrell, USDA Agricultural Research Service.

The stems are coarse, straight, stiff, and up to 4 feet tall. Partially compressed seed heads produce moderate amounts of viable seed each fall. The crowns enlarge slowly from short, almost vertical tillers. Some botanists believe that the habit and botanical characteristics of this grass intergrade completely with *Panicum amarum* Elliott.

Plant the seed 1 to 3 inches deep in dune sand, and mulch the area for best results. Seedling survival depends on adequate rainfall after germination. Clumps of coastal panicgrass can be dug, divided, and planted with good results during the summer rainy season (*13*).

Art Greenberg, Soil Conservation Service

Common bermudagrass

Common bermudagrass, *bermuda común* (*Cynodon dactylon* [L.] Pers.)

Bermudagrass is a low-growing, creeping perennial on coastal dunes of Alabama, Florida, Georgia, and Puerto Rico. It is most common on low dunes.

Bermudagrass spreads extensively by scaly rhizomes and flat stolons. The flowering culms are usually erect and have four or five spikes.

Seed can be purchased commercially. Bermudagrass can also be propagated from the rhizomes or stolons, which root readily. Seeding is especially effective in recreation areas where intensive management practices can be used.

Crowfoot grass, *yerba de Egipto* (*Dactyloctenium aegyptium* [L.] Willd.)

Crowfoot is an annual that occurs on dunes of the south Atlantic and Gulf coast and in Puerto Rico, but it occurs mostly in south Florida.

Crowfoot grows 6 to 18 inches tall and has compressed culms. The plant spreads by rooting at nodes on the ascending ends of the culms. Spikelets are short and have three or four spikes. Propagate from seed or culms.

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Crowfoot grass

Saltmeadow cordgrass

Saltmeadow cordgrass, *yerba de sal*
(*Spartina patens* [Ait.] Muhl.)

Saltmeadow cordgrass, a perennial, occurs on dunes throughout the south Atlantic and Gulf region and in Puerto Rico. Along the Atlantic coast of northern Florida, it is the dominant plant on dunes composed mostly of broken shell and coquina rock. This grass is especially salt tolerant (*19*).

Stems are slender and grow 2 to 3 feet tall. Leaves are rolled inward and resemble rushes. Seed heads are composed of two to several compressed spikes attached at nearly a right angle to the culm. Plants spread by means of a network of slender rhizomes.

Seed can be used for propagation (*13, 19*), but the percentage of viable seed varies greatly; for best results use seed that are freshly harvested. Plantings of vegetative material in early spring can also be successful. For large plantings, bare root planting stock is recommended, rather than seed (*12*). Stems rooted at the base, preferably with a section of rhizome attached, can be planted at a depth of 4 to 5 inches (*13*).

Sandbur

Sandbur, *abrojo* (*Cenchrus* spp. L.)

Many species of sandbur occur on coastal dunes throughout the south Atlantic and Gulf region and in Puerto Rico. It is often dominant in disturbed and heavily used areas. The most common species are *Cenchrus echinatus* L. and *C. tribuloides* L., which are annual grasses, and *C. gracillimus* Nash, *C. myosuroides* H.B.K., and *C. incertus* M. A. Curt., which are perennials.

Sandbur is low growing and branching, with flat leaf blades. It can easily be distinguished from other grasses by stiff, spiny burs. Because the burs are troublesome to bare feet after they mature, sandburs are generally not propagated by choice, although this feature is useful in reducing foot traffic.

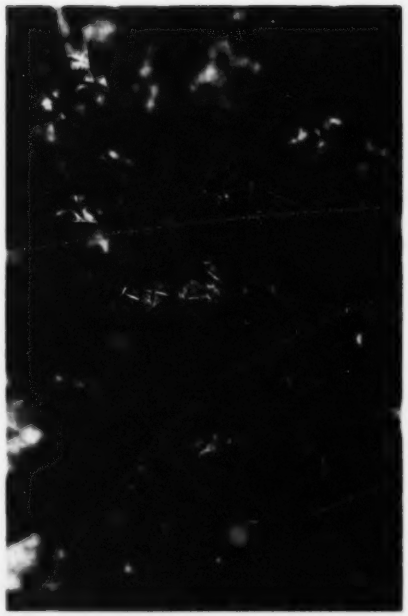
Propagate by seed or vegetative material. Mechanical seeding is difficult because the burs tend to stick to each other.

Seacoast bluestem (*Schizachyrium scoparium littorale* [Nash] Gould)

Schizachyrium species occur throughout the Gulf and south Atlantic coastal areas, but the most important one on coastal dunes is seacoast bluestem. It is common on coastal dunes adjacent to the Gulf of Mexico and could be used elsewhere if desired. It often forms a thick stand in areas leeward of the frontal dunes.

This prostrate or creeping perennial spreads by long rhizomes. It is easily distinguished by its grayish leaves and prostrate growth habit.

Propagate by vegetative means; the preferred material is the rhizomes, which root readily.



Seacoast bluestem

Seaoats

Seaoats (*Uniola paniculata* L.)

Seaoats, the most important and widespread grass on southern coastal dunes, is a perennial that occurs throughout the Gulf and south Atlantic coastal region.

The leaves are narrow and pale green. In northern locations they die back close to the ground each winter. The seed heads mature in the fall; they are compressed spikelets borne at the end of stiff stems 3 feet long or more. Individual seeds resemble those of common oats (*Avena sativa* L.). Rhizomes are relatively few and almost as coarse as the stems.

Seaoats can be established by digging and dividing native plants (*13, 19*). Dig the plant as deeply as possible to get part of its rhizome. When replanting, set the stock at least a foot deep and pack it tightly.

Small potted plants established from seed are commercially available in Florida. Under natural conditions, seed germination is not high and seedling survival is low (*13, 19*).

Florida state law prohibits picking the seed heads without a permit. Local regulations may be even more restrictive.

Seashore dropseed, *matojo de burro*
(*Sporobolus virginicus* [L.] Kunth)

Seashore dropseed occurs throughout the south Atantic and Gulf region. In Puerto Rico, this low-growing perennial is widespread and is dominant on most coastal dunes.

This grass spreads by extensive rhizomes and occasional stolons. Culms are stiff and 6 to 18 inches tall. Leaves are numerous and 2 to 4 inches long. Extensive colonies, with few flowering culms, occur in wetter areas of coastal dunes. In pure stands this grass resembles common bermudagrass.

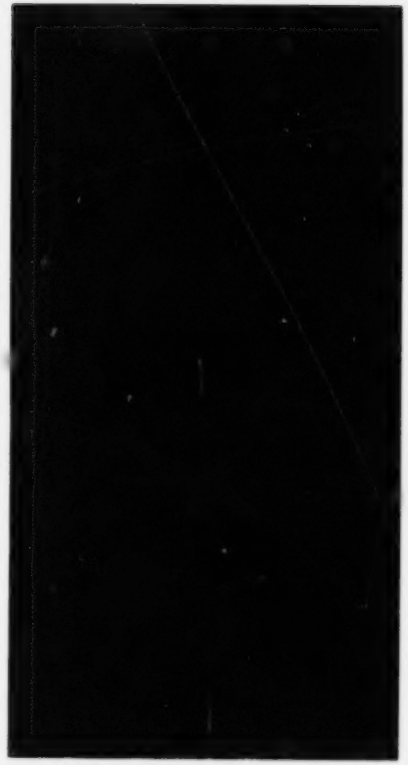
Propagate by vegetative methods. Rhizome pieces are the preferred material for propagation; they root readily. Use should be limited to low dunes with favorable moisture conditions.

Seashore paspalum, *cortadera*
(*Paspalum vaginatum* Swartz)

Seashore paspalum is a low, creeping perennial grass. It is a dominant plant on low dunes and in wetter areas of dunes along the Atlantic coast of Florida and Georgia and in Puerto Rico. It is also widespread along the Gulf coast. On wetter sites this grass makes a very dense, flat sod when it is mowed.

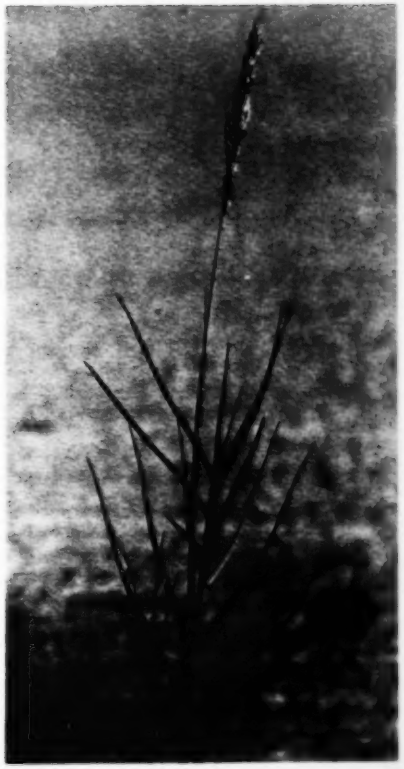
Seashore paspalum spreads by runners as well as rhizomes. It resembles common bermudagrass except for the seed head. There are usually two racemes; these are erect at first but spread at maturity.

Morton (*17*) recommends planting drier areas by transplanting bits of sod, firming, and mulching. This grass can also be propagated by transplanting runners or rhizomes.



Seashore dropseed

Seashore paspalum



Seashore saltgrass

Seashore saltgrass (*Distichlis spicata* [L.] Greene)

Seashore saltgrass is a low-growing perennial that occurs primarily on coastal marsh areas. It is also found on low coastal dunes of Florida, Georgia, and Alabama. In southwest Florida it is a dominant plant on many low dunes adjacent to the Gulf of Mexico.

This grass spreads extensively by rhizomes and occasionally by stolons. Culms are stiff and 6 to 18 inches tall. Blades are numerous, sharp pointed, 2 to 4 inches long, and conspicuously two ranked. In pure stands this grass resembles common bermudagrass.

Use of seashore saltgrass should be limited to low dunes where moisture conditions are favorable. Propagation is by vegetative methods. Rhizome and stolon pieces root readily, and fertilization will stimulate initial plant growth (*21*).

St. Augustine grass, *yerba San Augustin* (*Stenotaphrum secundatum* [Walter] Kuntze)

This perennial grass, used mainly on lawns, occurs naturally on some coastal dunes in Florida and Puerto Rico. Good growth requires intensive management, including irrigation and fertilization.

St. Augustine grass

Stiffleaf eustachys

Stiffleaf eustachys, *yerba de dedo*
(*Eustachys petraea* [Swartz] Desv.)

Stiffleaf eustachys is a suberect perennial bunchgrass that occurs along the Gulf and south Atlantic coast and in Puerto Rico but is not dominant at any location.

This grass produces some stolons. Culms are 1 to 3 feet tall and strongly compressed. The numerous leaf blades are folded and 4 to 8 inches long. The inflorescence is composed of four to six racemes 2 to 3 inches long.

Stiffleaf eustachys can be propagated from seed, stolons, or rooted decumbent culms.

Robert M. Craig, Soil Conservation Service

Beach bean

Beach bean, *haba de playa*
(*Canavalia maritima* [Aubl.] Thouars)

Beach bean, a creeping perennial vine, occurs in Florida on dunes south of St. Johns County along the Atlantic coast and south of Pasco County along the Gulf coast. It is also extensive on dunes in Puerto Rico. It is a good plant for coastal sand dune reclamation (*1*).

The thick, fleshy stems extend several feet. Flowers are pinkish purple and nearly 1 inch long. Racemes are long and stout; seed pods are thick and average 6 inches long.

Propagate from runners or seed. Seed soaked in warm water for several hours germinate readily.

Beach morningglory, *bejuco de playa* (*Ipomoea pes-caprae* [L.] R. Br.)

Beach morningglory, also known as railroad vine, is a prostrate, spreading perennial vine. It occurs on coastal dunes throughout the south Atlantic and Gulf region and in Puerto Rico. It is not dominant on Gulf dunes.

The stems are thick, fleshy, and flexible and may extend 75 feet. The shape of the leaf blade resembles the footprint of a goat. The pink-purple flowers are bell shaped and up to 3 inches wide. They are borne on long stalks. Flowering occurs throughout the year in south Florida and Puerto Rico, but is limited to late summer and fall in north Florida, Georgia, Louisiana, Mississippi, and Texas.

Seeding is recommended (*3*), but plant material such as the runners can also be used. Seed soaked in warm water for several hours germinate readily.

Blanket flower (*Gaillardia pulchella* Foug.)

Blanket flower is a perennial that occurs on coastal dunes throughout Florida and the Gulf of Mexico region but is most common along Florida's northeast coast.

Plants are generally about 2 feet tall. Leaves are borne singly. They are narrow, commonly sharp toothed, and about 3 inches long. The conspicuous flowers commonly have crimson or purplish centers and yellow rays (see photo). *G. aestivalis* (Walter) H. Rock also occurs on a few dunes. Its flowers are yellow throughout.

Propagate from plant material by dividing clumps and transplanting them. Seed can be collected locally in the fall and planted in spring.

Beach morningglory

Blanket flower

Burrowing four o'clock

42

Burrowing four o'clock (*Okenia hypogaea* Schlecht. & Cham.)

Burrowing four o'clock is a small, prostrate annual that is limited to a few coastal dune areas of southeast Florida. Urban development has eliminated it from many areas, and it is on the Florida list of endangered species (*23*). It is much admired for its small attractive flowers.

The thick, sticky, downy stem creeps along the ground. Flowers are solitary, five pointed, 1 inch wide, and bright rose purple. The small fruit is produced underground.

Burrowing four o'clock is recommended for landscaping (*3*). Propagate by dividing the plant and transplanting the vegetative material. Harvesting the underground seed is very difficult and kills the plant.

43

Cucumberleaf sunflower

Cucumberleaf sunflower (*Helianthus debilis* subsp. *cucumerifolius* [Torr. & Gray] Gray)

This sunflower, one of the most beautiful of coastal dune plants, occurs in Florida south of Duval County along the Atlantic coast and occasionally south of Pasco County along the Gulf coast. It is a perennial except along the northern limits of its range.

One study of *H. debilis* recognizes nine subspecies (*14*). The greatest difference among them is that the subspecies discussed here is a low-growing plant, and the other eight have a more upright growth form.

This plant spreads rapidly by underground runners to form low, dense mats. Flower heads are about 2 inches wide with yellow rays and purplish-brown disks. The plant blooms throughout the summer.

Propagate from seed or vegetative material such as the runners, which can be collected locally.

Fiddle-leaf morningglory

Largeleaf pennywort

Fiddle-leaf morningglory, *batatilla* (*Ipomoea stolonifera* [Cirillo] J. F. Gmel.)

Fiddle-leaf morningglory is a small perennial vine on coastal dunes throughout the south Atlantic and Gulf region and in Puerto Rico. It is most common on dunes along the Atlantic coast north of Indian River County, Florida.

The leaves are long stalked; leaf blades either are unlobed and oblong or are broad and have three or five round-ended lobes. The flowers are white and up to 2 inches wide.

Propagate by using plant material such as the runners.

Largeleaf pennywort (*Hydrocotyle bonariensis* Lam.)

Largeleaf pennywort is a creeping perennial that occurs throughout the south Atlantic and Gulf region. It is most common in the more northerly locations.

Pennywort spreads by far-reaching underground stems. The height of the growth is about 6 inches. Leaves are bright, shiny green and scalloped along the edge.

Underground stems are white. Clusters of tiny white or pale-green flowers are produced on a vertical stem about 3 inches tall.

Propagate by digging and transplanting the rhizomes (*13*).

Partridge pea (*Cassia* spp. L.)

Partridge pea is an upright annual plant that occurs on coastal dunes throughout the south Atlantic and Gulf region. The most common species is *Cassia fasciculata* Michx.

Plants grow to 3 feet tall, but are usually shorter. Flowers are yellow with five petals.

Propagate from seed, which can be purchased commercially or collected before they shatter.

Sea purslane, *verdolaga rosada*
(*Sesuvium portulacastrum* [L.] L.)

Sea purslane is a creeping plant that occurs on coastal dunes throughout Florida, the Gulf of Mexico region, and Puerto Rico. It is most common in more southerly locations.

The plants form sprawling mats of growth. The succulent leaves are about ½ to 1½ inches long. Flowers are pink and have five sepals. The sepals have green outer sides and pink inner sides.

Vegetative material of sea purslane roots easily.

Partridge pea

Sea purslane

Planting Trees and Shrubs

Woody plants—trees and shrubs—are most abundant in the backdune and forest dune zones. The few woody species adapted to the frontal zone can become dominant there if wind and salt spray are moderate, but they will be smaller there than farther inland and they may be windsheared. This is especially true of the trees except for Australian pine, cabbage palm, and coconut palm.

Trees are defined by Little (*16*) as woody plants having one erect perennial stem or trunk at least 3 inches in diameter at breast height (4½ feet), a more or less definitely formed crown of foliage, and a height of at least 13 feet. Some of the 11 trees discussed here do not often reach this height on frontal dunes, but all generally reach a height of more than 6 feet.

Ten shrubs are discussed. Of these, eight grow to a mature height of 2 to 6 feet on frontal dunes; the other two have a prostrate or spreading growth form.

Woody species can be planted any time during the dormant season. A safe and easy way to start transplant stock is to replace beach sand with fertile topsoil material or other planting mix. Graetz (*13*) recommends a planting mix of peat moss, rotted sawdust, or ½-inch-diameter ground pine bark. Soak the mix in a water solution of high-nitrogen fertilizer for a few weeks and then thoroughly drain it. Before planting, resoak the mix briefly and then combine it with an equal volume of sand.

An alternative to this kind of planting mix is to simply broadcast about 1 ounce of 10–10–10, or similar analysis, fertilizer around each plant after it has begun growing. Wedging fertilizer into the bottom of the planting hole is also beneficial.

Spread mulch around the plants to prevent wind and water erosion, help the soil retain moisture, and protect the plants from high temperatures.

Air-layering is a method of propagating the woody species beach creeper, seagrape, and cocoplum by inducing above-ground stems to form roots while still attached to the parent plant. Select a stem about ¼ to 1 inch in diameter. Below a node, make a slanting cut about one-third through the stem. Lightly dust the cut with rooting stimulant. Around the cut, wrap the stem with a mass of moist sphagnum moss 3 or 4 inches in diameter. Enclose the moss with a piece of polyethylene film or kitchen-grade aluminum foil. Then, with string, secure the film or foil to the stem on both sides of the moss ball.

In this manner rooting can be induced at several nodes on the same stem, if desired. When abundant roots have formed, cut the rooted stem away from the parent plant, remove the film or foil, and transplant the stem.

In **ground-layering,** a method of propagating southern waxmyrtle and sea lavender, low-growing branches are brought in contact with the soil to stimulate rooting. Notch the branch where roots are desired, bend it downward so that it firmly contacts the soil, and mound moist soil over it where it is notched. Water often.

Before cutting rooted branches from the parent plant, be sure the roots are 3 or 4 inches long. If you are careful you can inspect the roots without damaging them. Replant rooted branches in containers or directly transplant them.

Australian pine, *pino Australiano*
(*Casuarina equisetifolia* L.)

Australian pine has become naturalized in south Florida, Puerto Rico, and part of south Texas. It occurs on Florida coastal dunes south of Pasco and Volusia Counties. It also occurs on dunes in Puerto Rico.

Australian pine has a spreading but slender crown. It can grow to a height of 70 feet. The seed are in a small, globular or oblong, conelike fruit.

This tree casts dense shade and, over time, produces a thick layer of surface residue from the needles it sheds. The shade and residue drastically reduce the number and density of low-growing species. This reduction can cause increased erosion of the beach or dune.

Propagate by seeding or by transplanting seedlings.

Australian pine

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Shade from Australian pine prevents establishment of low-growing dune plants that require full sun.

52

Art Greenberg, Soil Conservation Service

Baycedar

Baycedar, *quitarán* (*Suriana maritima* L.)

Baycedar, a small tree with a sturdy, branching trunk, is native to coastal dunes of Puerto Rico and of Florida south of Sarasota and Indian River Counties. Its mass of slim, erect branches forms a broad, dense canopy that arches gracefully outward from the trunk.

Mature leaves of baycedar are grayish or yellowish green, narrow, and minutely downy. New leaves and twigs are distinctly downy. Flowers are yellow and have conspicuous green sepals. Fruits are round, furry, and light brown.

Small seedlings have been transplanted with good results (3).

Baycedar in the forest zone of a coastal dune area.

Buttonwood (*Conocarpus erectus* L.)

Also known as button mangrove, buttonwood occurs on coastal dunes in Florida south of Indian River and Pinellas Counties. Another form, silver buttonwood (*C. erectus* L. var. *sericeus* Fors ex DC.), is native only to the Florida Keys.

On coastal dunes buttonwood is shrubby and seldom reaches its normal height of 40 feet. The thin bark is dark gray and peels in long strips. The red-brown, conelike fruits mature year round. Leaves of buttonwood are green; those of silver buttonwood are silver gray, soft, and fuzzy.

Buttonwood can be grown from seed, but Bush and Morton recommend propagation from cuttings (*3*). Container-grown silver buttonwood is available from most commercial nurseries in south Florida.

Silver buttonwood is used mainly as an ornamental.

55

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Cabbage palm

Cabbage palm (*Sabal palmetto* [Walter] Lodd. ex J. A. & J. H. Schultes)

The cabbage palm, Florida's State Tree, occurs naturally on dunes throughout Florida and Georgia but is most common along the south Florida coast. It grows to a height of 80 feet. The diameter of the brown to gray trunk can reach 18 inches. The fan-shaped leaves are persistent, alternate, and dark green. They grow 5 to 6 feet long.

Bush and Morton (*3*) recommend cabbage palm for landscaping because of its long life, hardiness, and freedom from maintenance. They recommend propagation from seed, which germinate in about 6 weeks. Small palms in containers can be purchased from nurseries. Palms less than about 2 feet tall are easy to transplant. With the proper equipment, mature palms can be removed for transplanting almost any time of year.

Chickasaw plum

Art Greenberg, Soil Conservation Service

Chickasaw plum (*Prunus angustifolia* Marshall)

This small, twiggy deciduous tree occurs on a few coastal dunes in west Florida and Alabama. It is widely distributed inland.

On coastal dunes, Chickasaw plum generally reaches a height of less than 8 feet. The leaves are lance shaped, shiny green, finely toothed, and less than 2 inches long. Sprouts from root suckers enable the plant to spread and produce dense thickets. Snow-white blossoms begin appearing in February, before the leaves.

The small fruits of Chickasaw plum have soft, juicy flesh and ripen to a red or yellow color in early to mid summer. They are eaten by wildlife, especially birds.

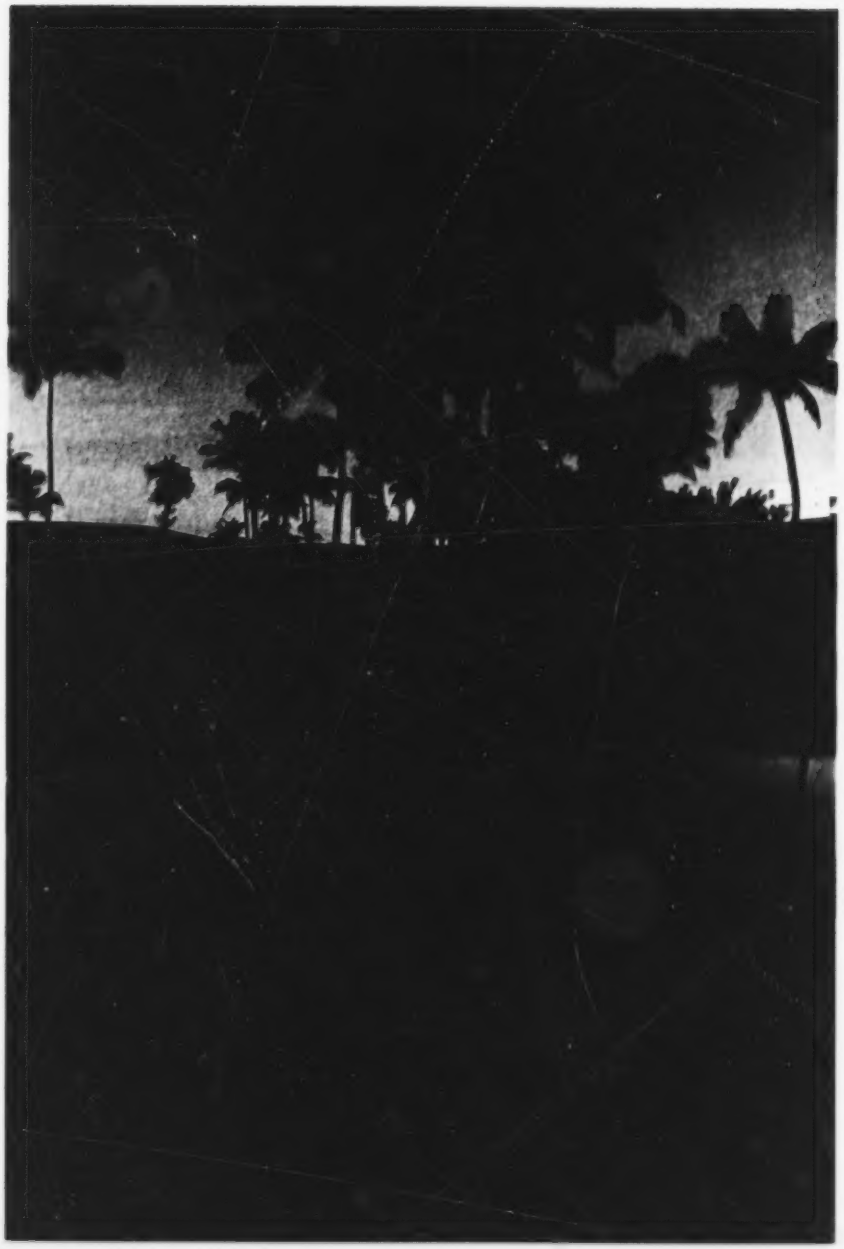
Small plants can be transplanted during the winter dormant season. Graetz (*13*) suggests planting cleaned seed in fall. Nursery-grown plants are sometimes available in north Florida.

Coconut palm, *palma de coco*
(*Cocos nucifera* L.)

This naturalized palm is very common on coastal dunes of Puerto Rico, where it is the dominant plant at many locations. It is also dominant in a few coastal dune areas of southeast Florida. In Florida it occurs on the Atlantic coast south from Indian River County and on the Gulf coast south from Manatee County.

Coconut palm can grow to a height of 80 feet. The trunk has an enlarged base and is usually curved. The leaves are leathery and grow 15 feet long. The fruit has a thick, fibrous husk and is 8 to 12 inches long.

Propagate coconut palm by placing the entire fruit in a horizontal position halfway in the soil (*2*). Germination occurs within a few months. Small palms can be purchased from nurseries.



Coconut palm

Robert M. Craig, Soil Conservation Service

Cocoplum

Cocoplum, *hicaco* *(Chrysobalanus icaco* L.)

Cocoplum is a small evergreen tree with dense foliage from the ground up. It is native on coastal dunes in Puerto Rico and in Florida south of Volusia and Pinellas Counties.

Cocoplum generally grows to a height of 12 feet. It is free of pests and diseases, and the foliage is naturally symmetrical and can be easily shaped as a hedge. These features make cocoplum excellent for landscaping. The leaves are glossy dark green and somewhat leathery. The small white flowers produce round, yellow to red fruits 1 to 2 inches in diameter.

According to Bush and Morton (*3*), cocoplum grows slowly from seed; they suggest propagating it by air-layering (see page 23) or rooting hardwood cuttings under mist.

Sand live oak

61

Sand live oak (*Quercus virginiana* Mill. var. *geminata* [Small] Sarg.)

Sand live oak is an evergreen tree that generally has a shrubby growth form on coastal dunes because of wind and salt spray (see photograph, page 4). On Atlantic coastal dunes, it occurs in Georgia and in Florida from St. Johns County north. It also occurs along Florida's Gulf coast north of Sarasota County and in the other Gulf coast states. *Quercus* species hybridize readily, and many hybrid forms are found locally.

The branches of sand live oak, widespreading and often touching the ground, add to its attractiveness for landscaping. The leathery leaves are shiny dark green above, pale and pubescent underneath. Acorns are borne singly or in pairs; at maturity they are dark brown and oblong, about ¾ inch long.

According to Graetz (*13*), sand live oak is one of the few trees that can be seeded directly on dunes. Collect acorns in autumn and plant them as soon as possible at a depth of 1½ inches. The seed germinate rapidly. Balled and burlapped nursery stock is often available locally.

62

On frontal dunes, seagrape grows as a low shrub.

Seagrape, *uvero* (*Coccoloba uvifera* [L.] L.)

Seagrape is a native evergreen that is dominant on coastal dunes in Puerto Rico and in Florida south of Volusia and Pinellas Counties. It is extensively used as an ornamental throughout south Florida.

On frontal dunes seagrape generally has a low, shrubby growth form. Elsewhere its normal mature height is 15 to 25 feet. The thick, dark-green, leathery leaves are 4 to 5 inches long and 5 to 6 inches wide. The fruits hang in bunches and ripen in the fall.

Bush and Morton (*3*) recommend propagation by seed, air-layering (see page 23), or cuttings. Seagrape plants are readily available at commercial nurseries in south Florida.

63

Seagrape

64

Southern waxmyrtle

Southern waxmyrtle (*Myrica cerifera* L.)

Southern waxmyrtle, also known as southern bayberry, is an evergreen that is native to dunes along the Atlantic coast in Georgia and north Florida and along the Gulf coast in west Florida.

On coastal dunes waxmyrtle usually grows less than 10 feet tall. The leaves are leathery and yellowish green and have a fresh aromatic scent when crushed. The small, gray-white, wax-covered berries mature in the fall and form clusters on old wood. The dense branches provide good nesting sites, and the berries are choice food for many birds.

Graetz (*13*) recommends propagation from cuttings of ripened wood in spring and summer, or by ground-layering (see page 23). Seed, with the wax removed, can be planted in the fall.

65

Spanish-bayonet, *aguja de Adán*
(*Yucca aloifolia* L.)

Spanish-bayonet is a distinctive woody plant that occurs extensively on coastal dunes in Florida. It also occurs on a few dunes in the other Gulf coast states and in Georgia and Puerto Rico.

The daggerlike leaves grow from a central crown; bottom leaves die off as the central stem lengthens. Flowers, cream colored and bell shaped, appear on the stem in summer. Heavy, blackish-purple fruits ripen in the fall.

Spanish-bayonet can be propagated by seeding or transplanting (*13*). To transplant, cut 2- to 3-foot lengths of the stem and plant the butt ends about 1 foot deep.

Spanish-bayonet

66

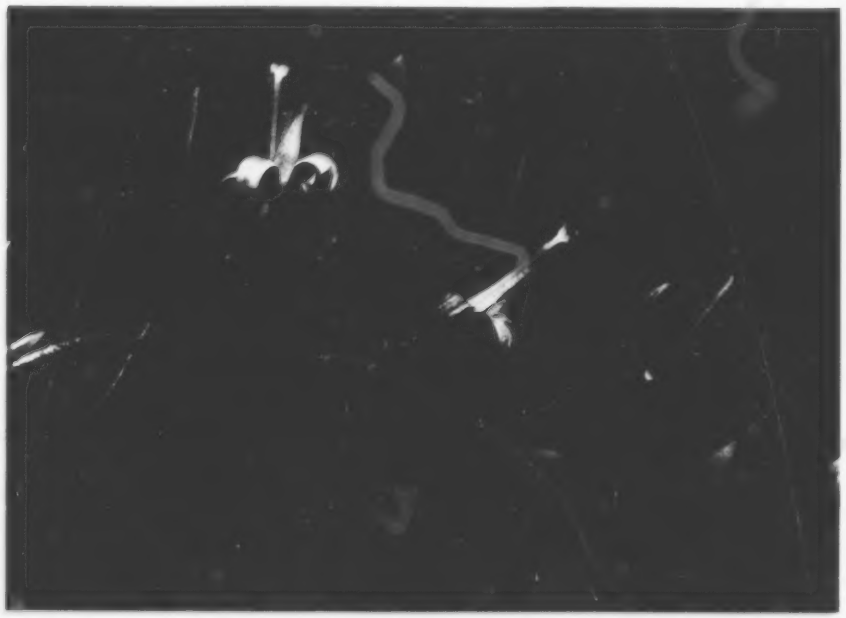
Beach creeper (*Ernodea littoralis* Swartz)

Beach creeper is a low-growing shrub that occurs on coastal dunes in Florida south of St. Lucie and Pinellas Counties. It is on the Florida list of threatened plant species (*23*).

The stems are prostrate or spreading; leaves are leathery, narrow, about 1 inch long, and often grow in clusters. Beach creeper produces many yellow berries, and the flowers are especially attractive in early summer.

Propagate from cuttings or seed or by air-layering (see page 23). Using 4- to 5-inch cuttings, treat about 1 inch of the basal parts with auxin-B rooting compound. Plant the cuttings 3 to 4 inches deep in sand. Provide 65 to 75 percent shade and decrease the shade gradually as the plant grows.

To grow beach creeper from seed, first remove the pulp. Plant seed ¼ inch deep in leached sand.



Beach creeper

Prickly pear cactus

Cactus, *tuna* (*Opuntia* spp. Mill.)

Cacti are native to coastal dunes throughout the south Atlantic and Gulf region and in Puerto Rico. Prickly pear (*Opuntia stricta dillenii* [Ker-Gawl.] L. Benson) is the most common.

Prickly pear grows to a height of less than 6 feet. The trunk is short and bushy with branches of flat, oval, or oblong fleshy joints. These joints, thick and light green, are connected end to end and armed at intervals with clusters of spines. The flowers are very showy and are yellow, salmon, or reddish. The pear-shaped fruits are red or purple.

Opuntia are propagated by breaking or cutting off a joint, drying it for a few days, and placing the cut end in the soil.

Coin vine, *siso* (*Dalbergia ecastaphyllum* [L.] Taubert)

Coin vine is a spreading shrub that occurs on coastal dunes in Puerto Rico and in Florida south of Volusia and Pinellas Counties.

The plants often form an impenetrable thicket of long, interlaced branches, and this trait limits their use in landscaping. Leaves are large and solitary; flowers are inconspicuous and white or pinkish. The flat, circular seed pod holds one seed and is ½ to 1 inch wide.

Propagation methods are undetermined, but it appears that seed, cuttings, or transplants can be used. Seeding may be the best method.

Coin vine

69

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Inkberry

Inkberry, *boborón* (*Scaevola plumieri* [L.] Vahl)

Inkberry is an attractive shrub that occurs on coastal dunes in Florida south of Manatee and Brevard Counties and in Puerto Rico. In a few locations it is a dominant plant.

The stems are often trailing and spreading, forming dense clumps. The dark-green leaves form attractive rosettes at their tips. Small white flowers are borne in small clusters along the terminal leaves and spread out like a fan. Similar to the native inkberry is *S. frutescens* (Mill.) Kurt Krause, which is commonly used as an ornamental in coastal areas.

Bush and Morton (*3*) recommend transplanting inkberry by detaching stems that have rooted naturally. The plant can also be propagated from seed.

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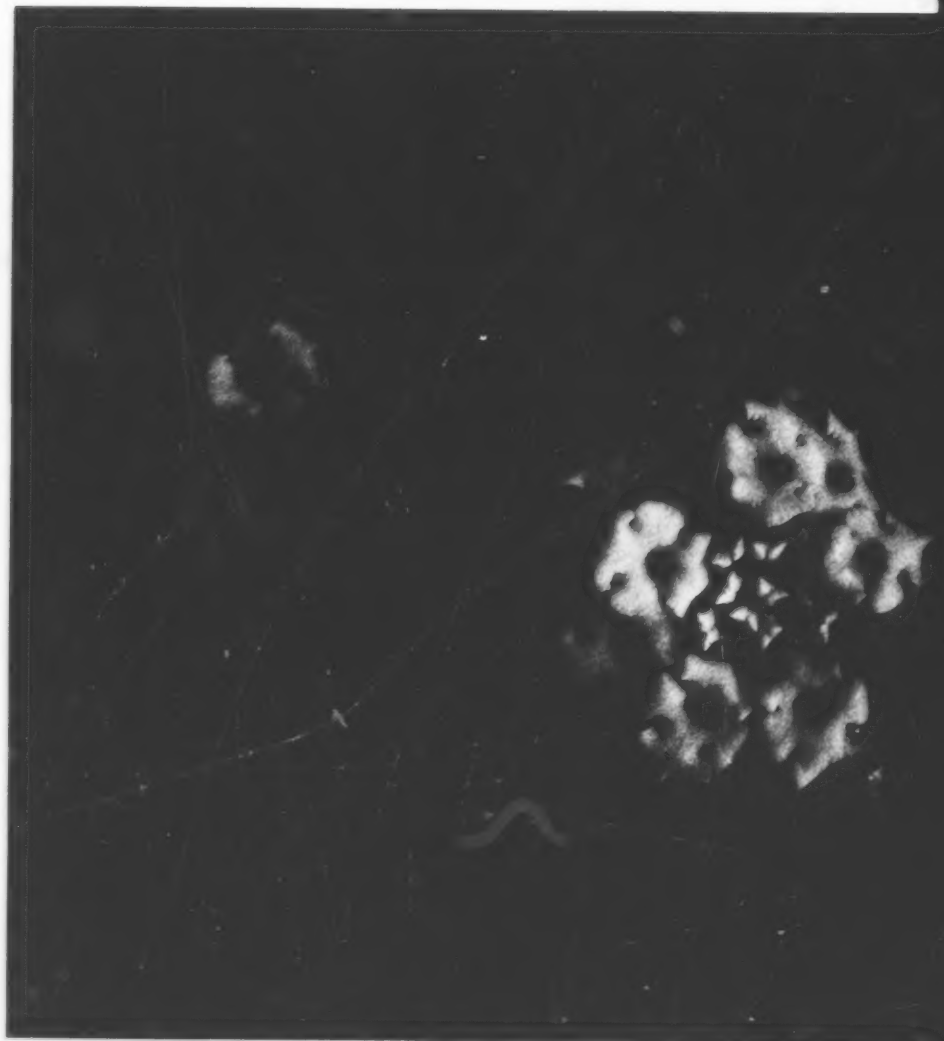


Lantana

72

Lantana (*Lantana* spp. L.)

Several species of lantana occur on dunes along the Gulf coast and the Atlantic coast of Florida.

Leaves of lantana are aromatic and light green. Many small yellow, orange, red, and lavender flowers grow on spikes of flat-topped clusters from 1 to 2 inches wide. The green berries are toxic to humans.

Bush (*2*) recommends propagation by cuttings or seed. Lantana is available at commercial nurseries.

Saw-palmetto

Saw-palmetto (*Serenoa repens* [W. Bartram] Small)

Saw-palmetto is a native shrub that occurs on Atlantic coastal dunes of Florida and Georgia and along the Gulf coast from Florida to Louisiana.

The fan-shaped leaves are green to gray green, have sharp-toothed petioles, and grow as wide as 3 feet. The black to bluish fruits range from ovoid to pear shaped and are ½ to ¾ inch in diameter.

Saw-palmetto is extremely difficult to transplant, but small seedlings can be successfully transplanted if the plants are well maintained after replanting. Bush and Morton (*3*) suggest propagation from seed, which germinate in about 6 weeks.

Sea lavender (*Tournefortia gnaphalodes* [L.] R. Br.)

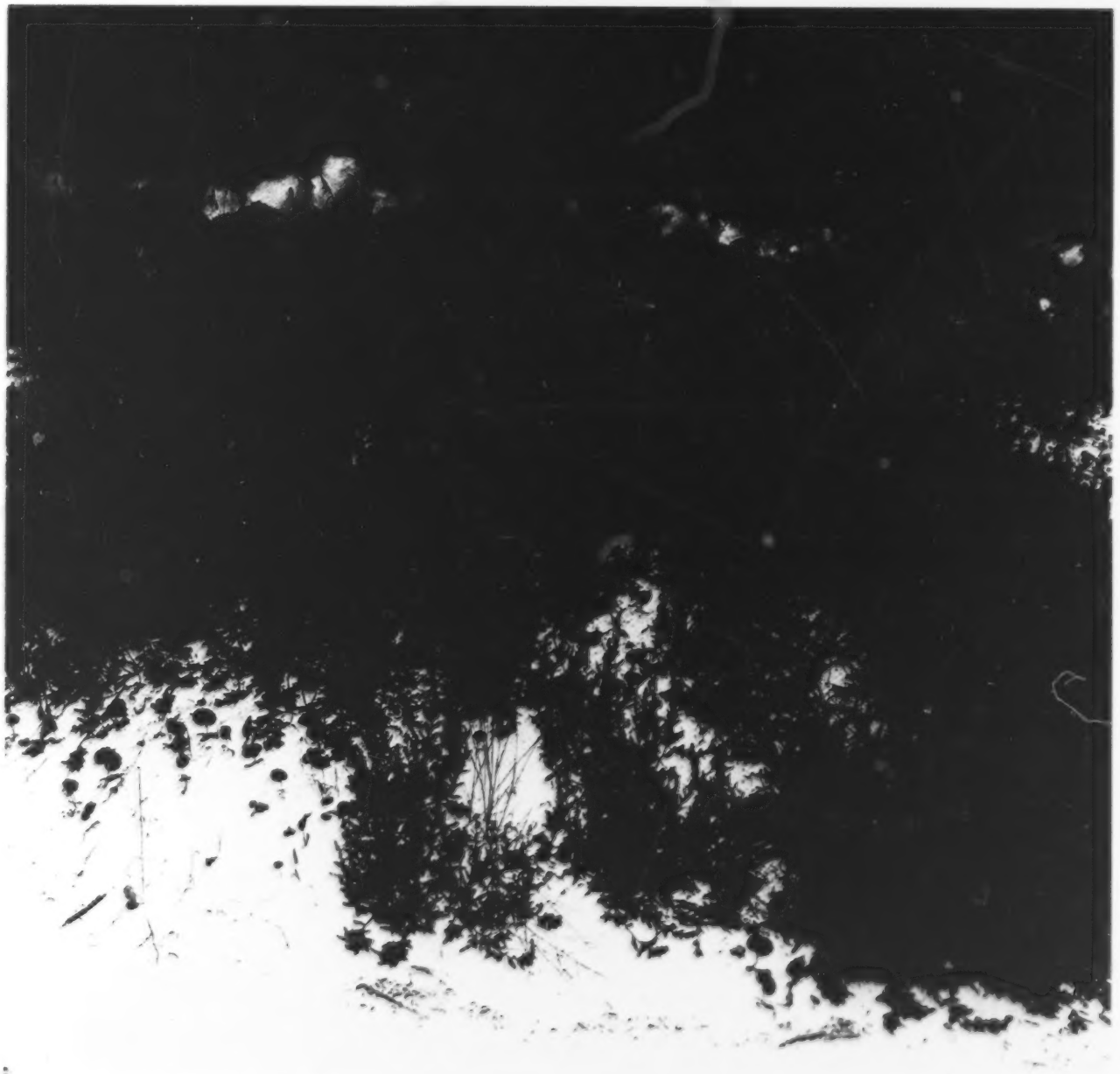
Sea lavender, one of the most conspicuous and attractive of coastal dune shrubs, occurs naturally on Florida coastal dunes in Martin, Palm Beach, and Monroe Counties. It is on the Florida list of threatened plant species (*23*).

Sea lavender produces many branches, which are somewhat fleshy and often form clumps. Leaves are slender, light grayish green, soft, and downy. Rosettes form at the leaf tips. Flowers are small, white, and bell shaped.

You can root cuttings by using a rooting compound and watering adequately. Low branches that touch the soil root naturally and, when detached, transplant satisfactorily. Bush and Morton (*3*) suggest transplanting small seedlings, growing plants from seed, or ground-layering (see page 23).

Sea lavender

Seashore elder



Seashore elder traps sand, forming low dunes.

Seashore elder (*Iva imbricata* Walter)

Seashore elder occurs on coastal dunes throughout the south Atlantic and Gulf region. The dominant plant at many locations, seashore elder is particularly well adapted on the Atlantic coast.

The sparse woody stems of seashore elder grow more or less upright, 1 to 4 feet tall. The leaves are fleshy, narrow, and lance shaped. When buried by soil, a stem develops a strong system of rhizomes and roots. Sand accumulates around the plant to produce low, gently rounded dunes that are desirable in certain types of landscaping.

Small, first-year seedlings are easily transplanted in spring (*13*). Cuttings of ripened stems root readily, and seashore elder can also be seeded; collect and plant seed in fall.

Silverleaf croton forms a dense cover in this backdune zone.

Silverleaf croton, *hierba delvabali*
(*Croton punctatus* Jacq.)

Silverleaf croton is a short-lived perennial shrub that occurs on coastal dunes throughout the south Atlantic and Gulf coast region.

The pubescent, silvery leaves make this plant especially attractive for landscaping. The stem is tan, dusted with cinnamon. Small clusters of light-green blooms appear in late summer. The seed, a choice food of birds, are gray with dark mottles and ripen in the fall.

Graetz (*13*) recommends propagation by planting the seed from late fall to mid-March. Plant seed 1 to 1½ inches deep in dune sand.

Silverleaf croton

Art Greenberg, Soil Conservation Service

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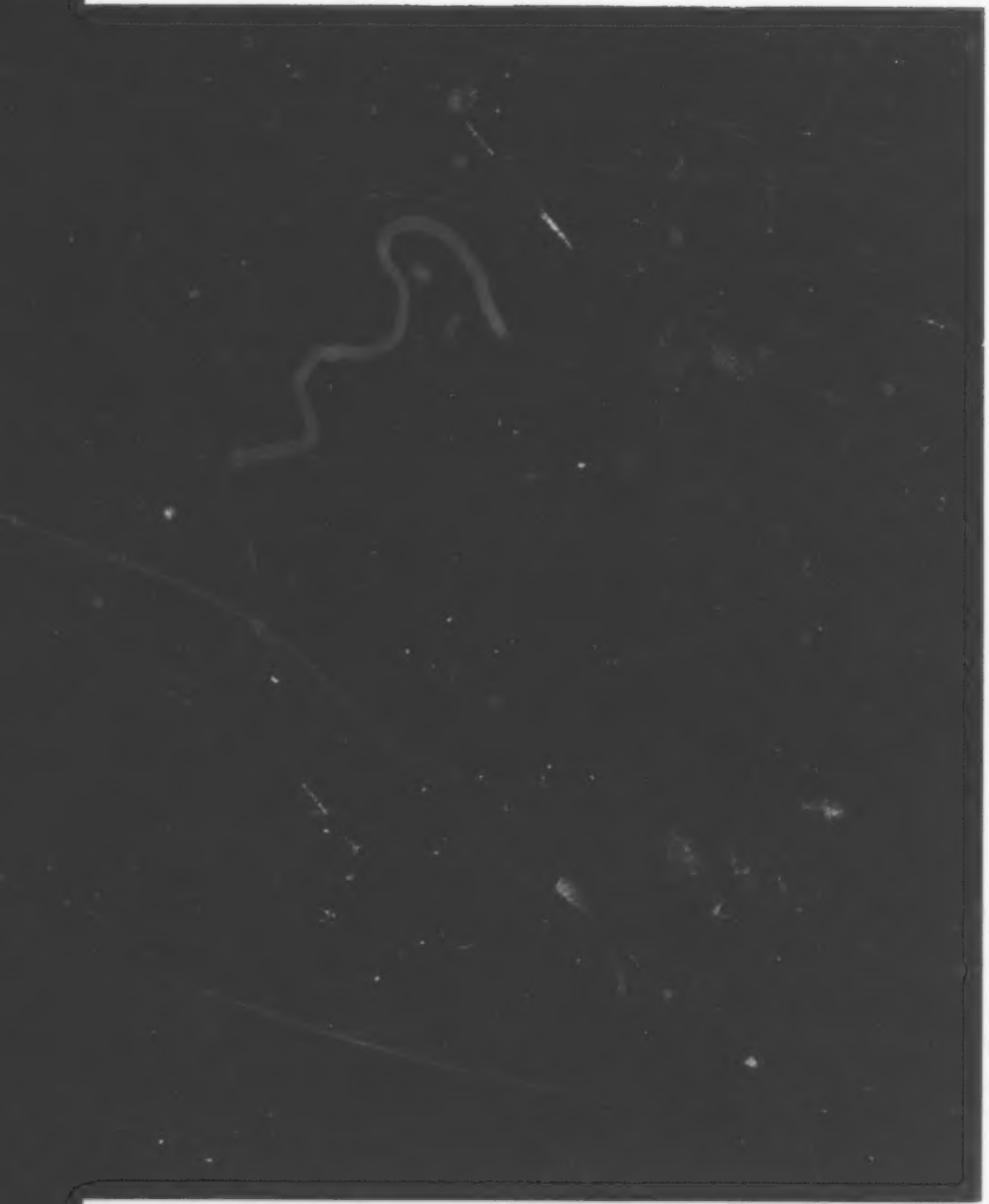

Yaupon holly

81

Yaupon holly in a backdune zone.

Yaupon holly (*Ilex vomitoria* Soland. in Ait.)

Yaupon holly occurs naturally on coastal dunes only in west Florida. The inch-long evergreen leaves are leathery and dark green. The flowers are barely noticeable, but the female yaupon produces an abundance of bright red berries in fall and winter. These are not edible by people but are a choice food of birds, especially cedar waxwing and mockingbird, who often use the plant's twiggy growth as nesting sites.

Propagation from seed is difficult. The seed take 2 years to germinate, and the plants must be cultivated another 2 years before they can be transplanted to the intended site. Cuttings of ripened wood are a better method, but root-inducing napthalenacetic acid should be used. Container-grown plants are available at some ornamental nurseries.

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—Robert M. Craig

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Appendix: Occurrence of Plants on Coastal Dunes

[Data from Craig (*4, 5, 6, 7, 8*)]

Plant name	Most likely in—		Frequency on study sites[1]				
	Frontal zone	Backdune zone	NE	SE	SW	W	PR
			Percent				
Grasses:							
bitter panicum	X		20	57	43	5	—
coastal panicgrass	X		37	23	24	50	—
common bermudagrass		X	9	1	12	5	19
crowfoot grass		X	1	11	10	2	4
saltmeadow cordgrass	X		80	41	19	45	15
sandbur		X	20	31	36	15	19
seacoast bluestem	X		—	—	—	38	—
seaoats	X		95	97	76	85	—
seashore dropseed	X		12	6	19	—	100
seashore paspalum	X		14	23	7	—	8
seashore saltgrass		X	26	12	10	5	—
St. Augustine grass		X	3	9	5	—	4
stiffleaf eustachys		X	6	17	19	—	23
Other herbaceous plants:							
beach bean	X		48	40	14	2	61
beach morningglory	X		49	71	24	32	73
blanket flower		X	26	6	7	5	—
burrowing four o'clock		X	—	9	—	—	—
cucumberleaf sunflower	X		40	80	7	—	—
fiddle-leaf morningglory	X		76	1	2	—	12
largeleaf pennywort		X	43	2	2	68	—
partridge pea		X	31	21	10	6	—
sea purslane	X		3	17	40	10	2

Plant name	Most likely in—		Frequency on study sites[1]				
	Frontal zone	Backdune zone	NE	SE	SW	W	PR
			Percent				
Trees:							
Australian pine	X		—	21	12	—	19
baycedar		X	—	14	7	—	—
buttonwood[2]		X	—	17	10	—	—
cabbage palm		X	9	9	5	5	—
Chickasaw plum		X	—	—	—	8	—
coconut palm	X		—	12	7	—	50
cocoplum		X	1	14	5	—	15
sand live oak		X	12	—	2	20	—
seagrape	X		17	49	21	—	61
southern waxmyrtle		X	12	—	—	25	—
Spanish-bayonet	X		43	40	26	2	15
Shrubs:							
beach creeper		X	—	9	2	—	—
cactus		X	26	14	12	2	15
coin vine	X		—	14	7	—	19
inkberry	X		—	26	17	—	4
lantana		X	6	23	2	5	—
saw-palmetto		X	23	17	5	7	—
sea lavender	X		—	14	—	—	—
seashore elder	X		66	80	26	30	—
silverleaf croton		X	46	23	12	35	—
yaupon holly		X	—	—	—	10	—

[1] Locations of the 191 study sites are abbreviated as follows:
NE = Northeast—Atlantic coast of Georgia and of Florida north of Indian River County, 35 sites.
SE = Southeast—Atlantic coast of Florida from Indian River County south to the Florida Keys, 50 sites.
SW = Southwest—Gulf coast of Florida south of Pasco County, 39 sites.
W = West—Gulf coast of Alabama and of Florida from Franklin County west, 40 sites.
PR = Puerto Rico, 27 sites.

[2] Includes silver buttonwood.

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